positions of grits, shale, and abundance of coal; one of the grits being pebbly. Thus the whole *method of variation* of the system of carboniferous strata becomes known, and appears nearly as in the diagram (*fig.* 18. p. 59.).

We may here notice the remarkable section presented in the Island of Arran, where according to Murchison and Sedgwick, the new and old red formations are merely separated by a thin zone of limestone and coal, or, as from a careful examination we should be disposed to express it, where only small and diminished members of the mountain limestone formation (in one place yielding coal) appear buried in masses of red conglomerate, sandstone and shale, of very great thickness, there being no certain criterion for deciding that any of this series belongs to the new red sandstone. This section is, however, much in accordance with the views of Hoffman, who, in north-western Germany, finds the carboniferous limestone and coal buried in a great body of red sandstones; the lower ones being attributed to old red, the upper ones to new red.

The total thickness of coal existing in the English and Scottish coal fields, is generally about 50 or 60 feet: this is, in most districts, divided into 20 or more beds, of a thickness from 6 feet to a few inches, alternating with from 20 to 50 or 100 times as great a quantity of sandstones and shales. But in some districts (Cumnock in Ayrshire, Dudley and Bilston in Staffordshire) many beds of coal, deposited one upon another with but little intervening earthy matter, constitute one mass 30 or 40 feet in thickness, in which the different beds are easily traced, and possess different qualities, probably depending on the original differences of the component vegetables, and the manner of their accumulation.

In the Newcastle coal district, the coal beds are arranged in the following order by Mr. Westgarth Forster: —

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